

**Naval Medical Research Institute**

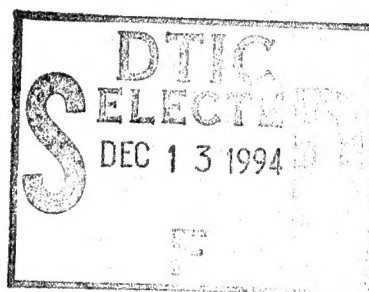
8901 Wisconsin Avenue  
Bethesda, MD 20889-5607



NMRI 94-66

November 1994

**QUANTIFICATION OF SPECIAL OPERATIONS  
MISSION-RELATED PERFORMANCE: PERFORMANCE DATABASE**



J. R. Thomas  
J. Schrot  
F. K. Butler, Jr.  
M. D. Curley

Naval Medical Research  
and Development Command  
Bethesda, Maryland 20889-5606

Department of the Navy  
Naval Medical Command  
Washington, DC 20372-5210

Approved for public release;  
distribution is unlimited

19941207 091

## NOTICES

The opinions and assertions contained herein are the private ones of the writer and are not to be construed as official or reflecting the views of the naval service at large.

When U. S. Government drawings, specifications, or other data are used for any purpose other than a definitely related Government procurement operation, the Government thereby incurs no responsibility nor any obligation whatsoever, and the fact that the Government may have formulated, furnished or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise, as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

Please do not request copies of this report from the Naval Medical Research Institute. Additional copies may be purchased from:

National Technical Information Service  
5285 Port Royal Road  
Springfield, Virginia 22161

Federal Government agencies and their contractors registered with the Defense Technical Information Center should direct requests for copies of this report to:

Defense Technical Information Center  
Cameron Station  
Alexandria, Virginia 22304-6145

## TECHNICAL REVIEW AND APPROVAL

NMRI 94-66

The experiments reported herein were conducted according to the principles set forth in the current edition of the "Guide for the Care and Use of Laboratory Animals," Institute of Laboratory Animal Resources, National Research Council.

This technical report has been reviewed by the NMRI scientific and public affairs staff and is approved for publication. It is releasable to the National Technical Information Service where it will be available to the general public, including foreign nations.

ROBERT G. WALTER  
CAPT, DC, USN  
Commanding Officer  
Naval Medical Research Institute

REPORT DOCUMENTATION PAGE			Form Approved OMB No. 0704-0188	
<small>Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.</small>				
1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE 14 November 1994	3. REPORT TYPE AND DATES COVERED Technical, January 93 - September 94		
4. TITLE AND SUBTITLE Quantification of Special Operations Mission-Related Performance Performance Database		5. FUNDING NUMBERS PE - 1160407B PR - 407BB TA - 001 WU -1314		
6. AUTHOR(S) John R. Thomas, John Schrot, *Frank K. Butler Jr. and **Michael D. Curley				
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Naval Medical Research Institute Commanding Officer 8901 Wisconsin Avenue Bethesda, Maryland 20889-5607		8. PERFORMING ORGANIZATION REPORT NUMBER  NMRI 94-66		
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) Naval Medical Research and Development Command National Naval Medical Center Building 1, Tower 12 8901 Wisconsin Avenue Bethesda, Maryland 20889-5606		10. SPONSORING / MONITORING AGENCY REPORT NUMBER		
11. SUPPLEMENTARY NOTES *Frank Butler Jr. is from the Naval Special Warfare Command **Michael D. Curley is from the Naval Submarine Medical Research Laboratory				
12a. DISTRIBUTION / AVAILABILITY STATEMENT  Approved for public release; distribution is unlimited.		12b. DISTRIBUTION CODE		
13. ABSTRACT (Maximum 200 words)  In order to evaluate the impact of environmental and physiological stressors on the conduct of Special Operations activities and techniques to minimize the effects of these stressors, it has become essential to develop standardized measurements of Special Operations mission-related performance and to ensure that measures selected relate as directly as possible to actual operational tasks. In order to select/develop appropriate measures of performance, information was needed on critical performance abilities required for specific Special Operations activities. To obtain the required abilities information, a database was developed providing data obtained from experienced, senior operators regarding critical performance abilities necessary for fifty-six specific Special Operations activities.				
14. SUBJECT TERMS  Thermal Stress, Cold Stress, Performance, Operational Tasks			15. NUMBER OF PAGES	
			16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT Unclassified	18. SECURITY CLASSIFICATION OF THIS PAGE Unclassified	19. SECURITY CLASSIFICATION OF ABSTRACT Unclassified	20. LIMITATION OF ABSTRACT  Unlimited	



## ACKNOWLEDGMENTS

This work was supported by the Special Operations Command work unit number 1160407B.407BB.001.1314. The opinions and assertions expressed herein are those of the authors and are not to be construed as official or reflecting the views of the Department of Defense, the Special Operations Command, the Department of Navy, or the Naval Service at large.

Accession For	
NTIS CRASH	<input checked="" type="checkbox"/>
DTIC	<input type="checkbox"/>
Unrestricted	<input type="checkbox"/>
Justification	
By	
Date	
Initials	
Signature	
A-1	



## QUANTIFICATION OF SPECIAL OPERATIONS MISSION-RELATED PERFORMANCE:

### PERFORMANCE DATABASE

The United States Special Operations Command (USSOCOM) is evaluating the impact of environmental and physiological stressors on the conduct of Special Operations and techniques to minimize the effects of these stressors. In order to accurately evaluate these factors, it has become essential to develop standardized measurements of Special Operations mission-related performance and to ensure that measures selected relate as directly as possible to actual operational tasks. This will enable changes in performance to be accurately and reproducibly quantitated and will significantly enhance the applicability and usefulness of future Special Operations Medical Research and Development research.

In response to the requirement to develop standardized measures of performance, the present report provides an archival documentation of the USSOCOM mission-related performance database created as part of the research program focused on development of measures of mission-related performance. The initial research phase of the program is concerned with the selection / development of appropriate measures of performance based on information about critical performance abilities required for specific Special Operations activities. To obtain the required abilities information the mission-related performance database was developed. The present report presents the significant features of the database.

The database presents critical Special Operations performance abilities or skills required for a range of mission-related activities. The database was established based on input from interviews with experienced, senior operators from the following organizations:

- Naval Special Warfare Group Two
- Seal Team Two
- Seal Team Four
- Seal Team Eight
- SDV Team Two
- Naval Special Warfare Development Group

The operators were provided with a listing of mission-related activities as well as a listing of Special Operations performance abilities. They were asked, based on their experience and training, to indicate the particular abilities they thought were most critical for performing each of the listed activities. They were asked to respond only to mission activities with which they were thoroughly familiar. The rather comprehensive list of mission-related activities was generated by the Naval Special Warfare Command and represents a wide range of missions.

#### List of Mission-Related Activities:

##### Small Unit Tactics

- Patrolling
- Interdiction
- Assaults
- Takedowns (Hostage Recovery)
- Intelligence Gathering
- Demolitions
- Cold Weather Patrolling
- Long Distance Hikes with Load
- Map / Compass Reading
- Downed Pilot Recovery
- Laser Target Designation
- Tactical Deception
- Personnel Extraction

##### Shooting

- Sniping
- Ambush
- Takedown
- Patrolling

##### Combat Swimmer Operations

- Limpet Attack
- Shipboarding
- Hydrographic Reconnaissance
- VSW Mine Countermeasures
- Obstacle Loading
- Underwater Searches
- Boat Drop and Pickup



## **SDV Operations**

- Ship Attacks**
- Hydrographic Reconnaissance**
- Over-the-Beach Operations**
- Underwater Searches**
- MK 16 / Air Combination Dives**
- Intelligence Gathering**
- Infiltration / Exfiltration**
- Piloting**
- Navigating**

## **Urban Warfare**

- Sprints**
- Stair Climbing**
- Jump to Wall / Window**
- Wall Ascents**
- Hostage Evacuations**

## **High Speed Boat Operations**

## **Dry Deck Shelter Hangar Operations**

## **Submarine Lock-Out / Lock-In**

## **Parachute Operations**

- Static Line**
- Free-Fall**

## **Fast Rope**

## **Rappelling**

## **Helo Cast and Recovery**

## **Small Boat Handling**

- Distance Paddles**
- Surf Passage**
- Rock Portage**

- Casualty Management
  - Patient Evaluation
  - Patient Resuscitation
  - Patient Evacuation

- Radio Operations
  - Radio Talking
  - Fire Support Calls

- Rock Climbing

The list of Special Operations performance abilities was developed from information provided by operators regarding critical basic skills and abilities required for the successful completion of missions. The information was obtained from personal interviews with senior operators and from the responses of experienced operators at the NSW Thermal Workshop held in 1991 in Virginia Beach, VA (Doubt TJ and Curley MD, Proceedings of the 1991 NSW Thermal Workshop, Naval Medical Research Institute Report 92-84, September 1992).

#### List of Critical Special Operations Performance Abilities:

- Cognitive (Mental)
  - Short Term Memory
  - Long Term Memory
  - Vigilance
  - Logical Reasoning
  - Decision Speed
  - Calculations
  - Acquiring Information
  - Display Recognition (SDV Controls)
  - Reaction Time

- Psychomotor
  - Manual Dexterity
  - Target Recognition
  - Hand Steadiness
  - Writing
  - Eye-Hand Coordination

Visual Acuity  
Hearing Ability  
Speaking Ability

Physical

Grip Strength  
Swimming  
Running  
Load Bearing Hikes  
Breath Holding  
Vertical Jump  
Climbing  
Stamina  
Cross Country Skiing  
Load Towing (Skiing)  
Balance / Equilibrium

The database was established by first summing the occurrences of each ability selected for each particular mission-related activity and then calculating a proportion (frequency) of the total abilities selected for that activity. The information was arranged in a relative format to account for the various ranges of abilities selected by different operators for each activity. The database lists the seven most frequently cited abilities (in order of frequency) for each activity. For example, the first mission activity presented in the database is Patrolling. The most frequently cited ability for the activity of patrolling is Vigilance. The number listed directly across from Patrolling, 85.3, is to be interpreted that 85.3% of the respondents selected Vigilance as a critical ability required in patrolling activities. The second most cited ability for Patrolling is Visual Acuity, in that 64.7% of the respondents selected Visual Acuity as important in Patrolling. The rest of the database is read in a similar fashion. Only seven abilities are provided for each activity as the consistency of responses becomes much more unreliable with further, less frequently cited abilities.

## PERFORMANCE ABILITIES REQUIRED FOR MISSION ACTIVITIES

### PATROLLING

Vigilance	85.3
Visual Acuity	64.7
Hearing Ability	64.4
Reaction Time	61.8
Stamina	61.5
Load Bearing Hikes	58.6
Logical Reasoning	50.0

### ASSAULTS

Decision Speed	87.5
Reaction Time	78.1
Target Recognition	71.9
Vigilance	59.4
Stamina	56.3
Logical Reasoning	53.1
Short Term Memory	40.6

## **INTERDICTION**

Vigilance	62.5
Target Recognition	59.4
Decision Speed	56.3
Reaction Time	53.1
Logical Reasoning	50.0
Acquisition	46.9
Visual Acuity	43.8

## **TAKEDOWNS (HOSTAGE RECOVERY)**

Decision Speed	87.5
Reaction Time	74.2
Logical Reasoning	61.3
Target Recognition	61.1
Vigilance	45.2
Acquisition	41.9
Stamina	41.5

## **INTEL GATHERING**

Long Term Memory	88.2
Short Term Memory	79.4
Acquisition	76.5
Vigilance	70.6
Visual Acuity	61.8
Target Recognition	55.9
Hearing Ability	50.0

## **DEMOLITIONS**

Calculations	65.7
Long Term Memory	57.9
Vigilance	52.9
Logical Reasoning	47.1
Manual Dexterity	44.1
Short Term Memory	43.2
Hand Steadiness	41.1

### **COLD WEATHER PATROLLING**

Stamina	76.9
Vigilance	73.1
Load Bearing Hikes	57.7
Long Term Memory	50.0
Short Term Memory	44.4
Logical Reasoning	44.3
Cross Country Skiing	41.2

### **LONG DISTANCE HIKES WITH LOADS**

Load Bearing Hikes	90.6
Stamina	87.5
Vigilance	43.8
Running	34.4
Balance	31.3
Short Term Memory	23.9
Logical Reasoning	21.8

## **MAP \ COMPASS READING**

Logical Reasoning	72.7
Calculations	66.7
Short Term Memory	57.6
Vigilance	51.5
Long Term Memory	47.5
Visual Acuity	45.4
Acquisition	37.3

## **DOWNED PILOT RECOVERY**

Vigilance	62.5
Logical Reasoning	60.0
Target Recognition	55.3
Long Term Memory	51.5
Decision Speed	50.7
Stamina	50.0
Short Term Memory	46.7



## **LASER TARGET DESIGNATION**

Vigilance	52.3
Target Recognition	50.0
Visual Acuity	46.2
Logical Reasoning	42.3
Calculations	38.5
Short Term Memory	36.6
Long Term Memory	34.5

## **TACTICAL DECEPTION**

Logical Reasoning	84.6
Vigilance	61.5
Short Term Memory	53.8
Decision Speed	46.2
Long Term Memory	42.3
Acquisition	39.6
Reaction Time	38.4

## **PERSONNEL EXTRACTION**

Decision Speed	62.1
Logical Reasoning	55.2
Vigilance	51.7
Target Recognition	37.9
Long Term Memory	36.5
Acquisition	34.5
Reaction Time	32.8

## **SNIPING**

Hand Steadiness	73.3
Visual Acuity	70.0
Calculations	66.7
Vigilance	65.7
Target Recognition	63.2
Logical Reasoning	56.7
Long Term Memory	50.0

## **AMBUSH**

Vigilance	67.6
Target Recognition	64.7
Decision Speed	63.8
Hearing Ability	61.6
Reaction Time	56.2
Visual Acuity	50.0
Logical Reasoning	44.2

## **TAKEDOWN (SHOOTING)**

Target Recognition	75.9
Vigilance	67.5
Decision Speed	65.4
Logical Reasoning	62.1
Reaction Time	51.7
Eye-Hand Coordination	46.8
Visual Acuity	41.3

## **PATROLLING (SHOOTING)**

Vigilance	74.2
Visual Acuity	64.5
Stamina	61.3
Acquisition	58.1
Logical Reasoning	57.8
Reaction Time	55.8
Load Bearing Hikes	53.1

## **LIMPET ATTACK**

Swimming	79.4
Vigilance	67.6
Target Recognition	61.7
Short Term Memory	60.8
Logical Reasoning	58.7
Calculations	55.8
Long Term Memory	52.9

## **SHIPBOARDING**

Climbing	63.3
Vigilance	62.1
Grip Strength	60.0
Decision Speed	56.3
Stamina	53.2
Logical Reasoning	50.0
Manual Dexterity	46.7

## **HYDROGRAPHIC RECON**

Swimming	82.4
Acquisition	67.6
Breath Holding	48.2
Stamina	47.0
Calculations	46.1
Visual Acuity	44.0
Short Term Memory	41.2

## **VSW MINE COUNTERMEASURES**

Vigilance	76.9
Long Term Memory	49.3
Decision Speed	47.8
Calculations	46.7
Swimming	46.0
Short Term Memory	40.5
Logical Reasoning	38.4

## **OBSTACLE LOADING**

Swimming	72.7
Breath Holding	69.7
Vigilance	57.4
Manual Dexterity	54.8
Calculations	53.7
Stamina	48.4
Long Term Memory	42.4

## **UNDERWATER SEARCHES**

Swimming	76.7
Vigilance	63.3
Short Term Memory	60.1
Acquisition	50.0
Logical Reasoning	48.7
Visual Acuity	46.6
Calculations	43.3

## **BOAT DROP AND PICKUP**

Swimming	67.7
Vigilance	48.4
Reaction Time	41.9
Logical Reasoning	40.9
Calculations	39.3
Eye-Hand Coordination	38.7
Stamina	36.8

## **SHIP ATTACKS**

Long Term Memory	64.6
Display Recognition	62.4
Vigilance	60.3
Logical Reasoning	54.8
Reaction Time	50.2
Swimming	50.0
Short Term Memory	37.5

## **HYDROGRAPHIC RECONS (SDV)**

Vigilance	64.6
Acquisition	62.4
Long Term Memory	56.4
Calculations	54.6
Reaction Time	53.1
Swimming	50.0
Short Term Memory	37.5



## **OVER-THE-BEACH OPS**

Vigilance	99.8
Reaction Time	62.5
Decision Speed	52.5
Swimming	51.8
Stamina	50.0
Short Term Memory	39.5
Long Term Memory	37.5

## **UNDERWATER SEARCHES**

Vigilance	67.7
Swimming	48.4
Decision Speed	41.9
Acquisition	40.9
Short Term Memory	39.3
Long Term Memory	38.7
Logical Reasoning	37.4

## **MK 16 / AIR COMBINATION DIVES**

Vigilance	85.7
Calculations	59.7
Swimming	57.1
Logical Reasoning	46.6
Display Recognition	44.9
Reaction Time	42.7
Short Term Memory	28.6

## **INTEL GATHERING (SDV)**

Vigilance	62.5
Short Term Memory	40.4
Long Term Memory	39.8
Logical Reasoning	37.6
Acquisition	37.1
Reaction Time	36.0
Visual Acuity	34.8

## **INFILTRATION / EXFILTRATION**

Vigilance	99.6
Logical Reasoning	42.6
Reaction Time	42.8
Short Term Memory	30.3
Long Term Memory	29.2
Decision Speed	28.6
Calculations	27.9

## **PILOTING (SDV)**

Vigilance	71.4
Logical Reasoning	59.3
Display Recognition	57.1
Long Term Memory	49.4
Calculations	44.8
Reaction Time	42.7
Short Term Memory	28.6

## **NAVIGATING (SDV)**

Vigilance	74.1
Logical Reasoning	59.7
Display Recognition	57.1
Long Term Memory	44.8
Calculations	43.9
Reaction Time	42.7
Short Term Memory	29.4

## **SPRINTS**

Running	79.3
Stamina	69.0
Balance	34.5
Reaction Time	27.6
Short Term Memory	26.4
Vigilance	24.4
Decision Speed	22.1

## **STAIR CLIMBING**

Stamina	78.6
Climbing	53.6
Running	46.4
Vigilance	34.6
Balance	32.1
Reaction Time	29.6
Vertical Jump	28.5

## **JUMP TO WALL / WINDOW**

Vertical Jump	85.2
Stamina	59.3
Reaction Time	39.1
Climbing	37.0
Grip Strength	33.3
Vigilance	29.7
Eye-Hand Coordination	28.6

## **WALL ASCENTS**

Stamina	74.1
Climbing	63.0
Grip Strength	51.9
Vertical Jump	44.4
Logical Reasoning	37.0
Reaction Time	29.9
Eye-Hand Coordination	29.6

## **HOSTAGE EVACUATIONS**

Decision Speed	68.6
Reaction Time	66.0
Vigilance	59.3
Logical Reasoning	44.4
Short Term Memory	40.7
Long Term Memory	39.1
Acquisition	37.0

### **HIGH SPEED BOAT OPS**

Stamina	77.3
Vigilance	63.6
Reaction Time	45.5
Decision Speed	44.9
Grip Strength	40.8
Short Term Memory	33.9
Eye-Hand Coordination	31.8

### **DDS HANGAR OPS**

Decision Speed	90.9
Reaction Time	54.5
Vigilance	45.5
Logical Reasoning	45.3
Short Term Memory	37.5
Long Term Memory	36.4
Acquisition	27.3

### **SUBMARINE LOCK-OUT / LOCK-IN**

Vigilance	73.9
Logical Reasoning	56.5
Manual Dexterity	47.8
Decision Speed	43.5
Long Term Memory	39.2
Swimming	38.1
Short Term Memory	34.8

### **STATIC LINE (PARACHUTE OPS)**

Decision Speed	71.0
Reaction Time	70.9
Vigilance	67.7
Short Term Memory	48.4
Logical Reasoning	45.2
Long Term Memory	43.4
Manual Dexterity	41.8



### **FREE-FALL (PARACHUTE OPS)**

Decision Speed	76.3
Reaction Time	75.0
Vigilance	67.9
Logical Reasoning	55.6
Manual Dexterity	53.5
Eye-Hand Coordination	42.9
Long Term Memory	39.3

### **FAST ROPE**

Grip Strength	88.2
Vigilance	52.9
Manual Dexterity	47.1
Reaction Time	45.1
Eye-Hand Coordination	44.0
Decision Speed	36.3
Visual Acuity	35.2

## **RAPPELLING**

Grip Strength	63.6
Vigilance	56.4
Manual Dexterity	54.4
Reaction Time	42.7
Eye-Hand Coordination	42.4
Decision Speed	39.6
Visual Acuity	36.4

## **HELO CAST AND RECOVERY**

Vigilance	54.1
Swimming	50.0
Reaction Time	44.1
Manual Dexterity	38.2
Visual Acuity	36.8
Grip Strength	35.2
Logical Reasoning	32.4

**DISTANCE PADDLES (SMALL BOAT )**

Stamina	90.9
Grip Strength	45.5
Vigilance	39.4
Manual Dexterity	37.2
Logical Reasoning	36.4
Eye-Hand Coordination	33.3
Short Term Memory	24.2

**SURF PASSAGE (SMALL BOAT)**

Stamina	66.7
Vigilance	51.5
Logical Reasoning	47.4
Decision Speed	45.4
Reaction Time	42.4
Manual Dexterity	39.4
Eye-Hand Coordination	35.6

### **ROCK PORTAGE (SMALL BOAT)**

Stamina	63.6
Vigilance	48.8
Logical Reasoning	48.4
Decision Speed	44.2
Reaction Time	38.6
Manual Dexterity	37.0
Eye-Hand Coordination	36.2

### **PATIENT EVALUATION**

Logical Reasoning	72.4
Decision Speed	65.5
Vigilance	62.1
Long Term Memory	55.2
Reaction Time	48.3
Acquisition	44.8
Short Term Memory	37.9

## **PATIENT RESUSCITATION**

Decision Speed	69.0
Vigilance	62.1
Long Term Memory	59.4
Logical Reasoning	58.6
Reaction Time	48.3
Short Term Memory	44.4
Manual Dexterity	41.5

## **PATIENT EVACUATION**

Logical Reasoning	77.8
Vigilance	59.3
Decision Speed	51.9
Short Term Memory	45.4
Long Term Memory	45.1
Reaction Time	44.3
Stamina	44.2

## **RADIO TALKING**

Speaking Ability	75.0
Short Term Memory	62.5
Hearing Ability	59.4
Long Term Memory	53.1
Vigilance	50.0
Logical Reasoning	40.6
Decision Speed	31.3

## **FIRE SUPPORT CALLS**

Speaking Ability	75.0
Short Term Memory	59.4
Calculations	55.4
Hearing Ability	53.1
Long Term Memory	43.8
Logical Reasoning	43.4
Vigilance	40.6

## ROCK CLIMBING

Grip Strength	78.6
Climbing	76.8
Stamina	71.4
Vigilance	42.9
Logical Reasoning	39.4
Manual Dexterity	37.9
Eye-Hand Coordination	33.4

In addition to the printed database as it appears in this report, a computer database file is available on disk which operates under Microsoft Excel. The database allows one to identify what unique patterns of abilities are involved in particular Special Operations activities or to indicate what activities involve a specific ability of interest, such as visual acuity.

Additionally, from the database a summation was obtained across all of the activities to generate the overall frequencies of abilities, that is, to obtain the seven most often cited abilities, considering all activities combined. These abilities are presented below:

### OVERALL SUMMARY OF SPECIAL OPERATIONS PERFORMANCE ABILITIES REQUIRED ACROSS ALL ACTIVITIES

Vigilance

Logical Reasoning

Short Term Memory

Reaction Time

Long Term Memory

Decision Speed

Calculations

Although it is appropriate to consider the development of a library of measures, established for the measurement of specific individual Special Operations mission performance based on information from the present database, it also appears appropriate to consider the measurement of critical abilities required in more universal Special Operations tasks. The above list of overall abilities may provide the information needed to guide the selection of measures of such general, basic critical performance abilities.